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National Advisory Committee on Immunization (NACI)*
STATEMENT ON INFLUENZA VACCINATION FOR THE 1996-97 SEASON

PREAMBLE

The antigenic components of the influenza vaccine have been updated for the 1996-97 season. The present statement has updated sections concerning recommendations for pregnant women, people infected with HIV, and healthy adults < 65 years of age.

In Canada, two measures are available that can reduce the impact of influenza: immunoprophylaxis with inactivated (killed-virus) vaccine and chemoprophylaxis or therapy with an influenza-specific antiviral drug (amantadine). Vaccination of persons at high risk each year before the influenza season is currently the most effective measure for reducing the impact of influenza.

Influenza A viruses are classified into subtypes on the basis of two surface antigens: hemagglutinin (H) and neuraminidase (N). Three subtypes of hemagglutinin (H1, H2, and H3) and two subtypes of neuraminidase (N1 and N2) are recognized among influenza A viruses that have caused widespread human disease. Immunity to these antigens — especially to the hemagglutinin — reduces the likelihood of infection and lessens the severity of disease if infection occurs. Infection with a virus of one subtype confers little or no protection against viruses of other subtypes. Furthermore, over time, antigenic variation (antigenic drift) within a subtype may be so marked that infection or vaccination with one strain may not induce immunity to distantly related strains of the same subtype. Although influenza B viruses have shown more antigenic stability than influenza A viruses, antigenic variation does occur. For these reasons, major epidemics of respiratory disease caused by new variants of influenza continue to occur. The antigenic characteristics of **current and emerging** strains provide the basis for selecting the virus strains included in each year's vaccine.

The 1995-96 influenza season was characterized by moderate activity that peaked in the early season (December) with a secondary peak around 1 March, 1996. Laboratory-confirmed cases were about 95% influenza A, the vast majority being of the H_1N_1 subtype, and the remainder were influenza B.

A summary of influenza activity in Canada during the 1995-96 season will appear in an upcoming issue of the *Canada Communicable Disease Report*.

The following are the results of completed strain characterization of influenza isolates submitted to LCDC between 1 November, 1995 and 25 April, 1996. One hundred and two (69%) of the 147 influenza A strains were of the H_1N_1 subtype and all were closely related to A/Texas/ 36/91; 45 strains (31%) were of the H_3N_2 subtype with 32 (71%) of these closely related to A/Johannesburg/33/94. The remaining H_3N_2 strains were also A/Johannesburg/33/94-like but had somewhat reduced reactivity with its antiserum. The three influenza B strains characterized were B/Beijing/184/93-like.

Globally, influenza A (H_3N_2), A (H_1N_1) and B viruses also continued to circulate[1]. Influenza A (H_1N_1) viruses were widely detected in the world, caused a widespread epidemic in Japan, and were the predominant influenza viruses in North America. However, the majority of the H_1N_1 isolates were closely related to A/Texas/36/91-like strains.

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Sporadic cases and isolations of influenza B were reported in various parts of the world and those analyzed were antigenically similar to B/Beijing/184/93 and B/Harbin/7/94[1].

In recent months, an increasing number of influenza A H_3N_2 isolates were antigenically distinguishable from A/Johannesburg/33/94. Viruses similar to these new variants, represented by A/Wuhan/359/95 and A/Nanchang/933/95, have been isolated in the far east as well as in the United States[1]. Moreover, vaccines containing A/Johannesburg/36/95 (H_3N_2)-like viruses induced protective hemagglutination inhibiting antibody responses to A/Wuhan/359/95 and A/Nanchang/933/95 (H_3N_2)-like strains in adults and the elderly at a lower frequency and often at a lower geometric mean titre than to the vaccine virus.

NACI, therefore, recommends that the trivalent influenza vaccine for the 1996-97 season contain an A/Wuhan/359/95 (H_3N_2)-like strain, an A/Texas/36/91 (H_1N_1)-like strain, and a B/Beijing/184/93-like strain.

The actual influenza strain used by North American vaccine manufacturers will likely be A/Nanchang/933/95 and B/Harbin/7/94 because of their growth properties.

Annual immunization is required because one or more of the vaccine components is changed each year. As well, immunity declines in the year following vaccination. Each 0.5 mL of vaccine will contain 15µg of hemagglutinin of each antigen. The vaccine will be available as either a whole-virus or a split-virus (chemically disrupted) preparation. Protection from the vaccine generally begins about 2 weeks after immunization and may last 6 months or longer. However, in the elderly, antibody levels fall below protective levels in 4 months or less. Thus, the preferred time for immunization of elderly individuals is November. Nevertheless, annual vaccination programs, such as those for residents of long-term care facilities, should begin as soon as vaccine is available in September or early October to ensure high coverage prior to significant circulation of influenza. Finally, no opportunity should be missed to give vaccine to any individual at risk who has not been immunized during the current season.

The following are recommendations for the prevention and control of influenza during the 1995-96 influenza season.

RECOMMENDED RECIPIENTS

People at high risk

Vaccination of people at high risk is the single most important measure for reducing the impact of influenza[2,3]. Priority should be given to ensure annual vaccination of people in the following groups:

- *Adults and children with chronic cardiac or pulmonarydisorders (including bronchopulmonary dysplasia, cystic fibrosis and asthma)* severe enough to require regular medical follow-up or hospital care. Chronic cardiac and pulmonary disorders are by far the most important risk factors for influenza-related death[4].
- *People of any age who are residents of nursing homes and other chronic care facilities*. Such residents often have one or more of the medical conditions outlined in the first group. In addition, their institutional environment may promote spread of the disease. Recent studies have shown that the use of vaccine in this setting will decrease the occurrence of illness and has an even greater impact on reducing the rates of hospital admission, pneumonia, and death[5,6].
- *People ≥ 65 years of age*. The risk of severe illness and death related to influenza is moderately increased in healthy people in this age group[7,8], but is not as great as in people with chronic underlying disease. Vaccination is effective in preventing hospital admission and death[9,10].
- *Adults and children with chronic conditions, such as diabetes and other metabolic diseases, cancer, immunodeficiency, immunosuppression, renal disease, anemia, and hemoglobinopathy*. The degree of risk associated with chronic renal and metabolic diseases in children is uncertain, but this uncertainty should not preclude consideration of vaccination.
- *Children and adolescents (age 6 months to 18 years) with conditions treated for long periods with acetylsalicylic acid*. This therapy might increase the risk of Reye's syndrome after influenza[11].
- *Persons infected with human immunodeficiency virus (HIV)*. Limited information exists regarding the frequency and severity of influenza illness among HIV-infected persons, but reports suggest that symptoms may be prolonged and the risk for complications increased for some HIV-infected persons. Because influenza can result in serious illness and complications, vaccination is a prudent precaution and will result in protective antibody levels in many recipients. However, the antibody response to vaccine may be low in persons with advanced HIV-related illnesses; giving a second dose of vaccine 4 or more weeks after the first does not improve the immune response for these persons. Further studies are also required to determine whether influenza immunization can adversely affect patients infected with HIV. To date, some studies indicate that influenza immunization can be associated with transient increases in plasma HIV concentration[12,13], but no study has demonstrated an adverse effect of this temporary change on HIV disease progression.

People capable of transmitting influenza to those at high risk

People who are potentially capable of transmitting influenza to those at high risk should receive annual vaccination.

- *Health care and other personnel who have significant contact with people in the high-risk groups previously described*. The potential for infecting people at high risk, particularly those in institutions, may be reduced through vaccination programs aimed at health care personnel.
- *Household contacts (including children) of people at high risk who either cannot be vaccinated or may respond inadequately to vaccination*. Because low antibody responses to influenza vaccine may occur in some people at high risk (e.g., the elderly, people with immunodeficiency[14]), annual vaccination of their household contacts may reduce the risk of influenza exposure.

Other people

- People who provide essential community services may be considered for vaccination to minimize the disruption of routine activities in epidemics. Vaccine should also be administered to other adults who wish to reduce their chances of acquiring infection and missing work as a consequence[15].
- *Pregnant women*. **Vaccination is recommended for pregnant women in high-risk groups (see above section)**. Vaccine is considered safe for pregnant women — regardless of their stage

of pregnancy. Although excess morbidity and mortality were observed among pregnant women during the pandemic outbreaks in 1918-19 and 1957-58, further studies are needed to determine whether pregnancy per se is a risk factor that warrants routine influenza immunization.

- People at high risk of influenza complications embarking on foreign travel to destinations where influenza is likely to be circulating should be vaccinated with the most current available vaccine. In the tropics, influenza can occur throughout the year. In the southern hemisphere, peak activity occurs from April through September. In the northern hemisphere, peak activity occurs from November through March.

RECOMMENDED USE

The recommended dosage schedule and type of vaccine are presented in Table 1. Both whole-virus and split-virus vaccines are available in Canada. Split-virus and whole-virus vaccines are similar with respect to immunogenicity, although whole-virus vaccines may be more immunogenic in the elderly[16]. The split-virus vaccine is generally associated with fewer side effects in children[17,18]. Either the split-virus or the whole-virus vaccine may be used in people ≥ *13 years of age. Only split-virus vaccines are recommended for those < 13 years of age.* Children < 9 years require two doses, with an interval of 4 weeks; the second dose is not needed if the child received one or more doses of vaccine prepared for a previous season.

Table 1
Recommended influenza vaccine dosage by age, 1996-97

Age	Vaccine Type	Dose, mL	No. of doses
≥ 13 years	Whole-virus or split virus	0.5	1
9–12 years	Split-virus	0.5	1
3–8 years	Split-virus	0.5	1 or 2
6–35 months	Split-virus	0.25	1 or 2

Intramuscular administration is preferred because data relating to influenza vaccine have generally been obtained after such administration. The deltoid muscle is the recommended site in adults and older children, the anterolateral thigh in infants and young children.

Adverse reactions

Influenza vaccination cannot cause influenza because the vaccine does not contain live virus. Soreness at the injection site lasting up to 2 days is common. Fever, malaise, and myalgia may occur within 6 to 12 hours after vaccination and last 1 to 2 days, especially in young adults who have received the whole-virus vaccine and those receiving vaccine for the first time. Prophylactic acetaminophen may decrease the frequency of some side effects in adults[19]. In children aged 2 to 12 years, fever and local reactions are no more frequent after administration of split-virus vaccine than after placebo injections. In those < 24 months of age fever occurs more often but is seldom severe.

Allergic responses are rare and are probably a consequence of hypersensitivity to some vaccine component, most likely residual egg protein, which is present in minute quantities.

Unlike the 1976-77 swine influenza vaccine, subsequent vaccines prepared from other virus strains have not been clearly associated with an increased frequency of Guillain-Barré syndrome. Influenza vaccine is not known to predispose to Reye's syndrome.

Contraindications and precautions

Influenza vaccine should not be given to people with known anaphylactic hypersensitivity to eggs manifested as hives, swelling of the mouth and throat, difficulty in breathing, hypotension and shock. Persons or individuals with acute febrile illness usually should not be vaccinated until their symptoms have abated.

Influenza vaccine is considered safe in pregnancy.

In infants < 6 months of age, influenza vaccine is less immunogenic than in infants and children aged 6 to 18 months. Therefore, immunization with currently available influenza vaccines is not recommended for infants < 6 months[20].

Although influenza vaccination can inhibit the clearance of warfarin and theophylline, clinical studies have not shown any adverse effects attributable to these drugs in people receiving influenza vaccine.

False-positive HIV antibody tests were reported after immunization with the 1991/92 influenza vaccines. The incidence of false-positive tests declined with the development of different tests so that such false-positive HIV antibody tests are not likely to be a problem now[21].

Simultaneous administration of other vaccines

The target groups for influenza and pneumococcal vaccination overlap considerably. Health care providers should take the opportunity to vaccinate eligible persons against pneumococcal disease during the same visit at which influenza vaccine is given. The concurrent administration of the two vaccines at different sites does not increase the risk of side effects. Pneumococcal vaccine, however, is given only once, whereas influenza vaccine is given annually. Children at high risk may receive influenza vaccine at the same time but at a different site from that used for routine pediatric vaccines.

Storage

Influenza vaccine should be stored at 2° C to 8° C and should not be frozen.

STRATEGIES FOR REDUCING THE IMPACT OF INFLUENZA

The effectiveness of influenza vaccine varies depending upon the age and immunocompetence of the vaccine recipient and the degree of similarity between the virus strain included in the vaccine and the strain of circulating virus during the influenza season. With a good match, influenza vaccination has been shown to prevent illness in approximately 70% of healthy children and adults. Under these circumstances, studies have also shown influenza vaccination to be approximately 70% effective in preventing hospitalization for pneumonia and influenza among

elderly persons living in the community. Studies among elderly persons residing in nursing homes have shown influenza vaccination to be 50% to 60% effective in preventing hospitalization and pneumonia and up to 85% effective in preventing death, even though efficacy in preventing influenza illness may often be in the range of 30% to 40% among the frail elderly.

Vaccination is recognized as the single most effective way of preventing or attenuating influenza for those at high risk of serious illness or death. Influenza vaccine programs should aim to vaccinate at least 90% of residents of long-term care facilities and of adults and children with the cardiac or pulmonary disorders listed previously. Nevertheless, only about 45% of this population receive vaccine annually.

It is not known how much of this low rate of utilization is due to failure of the health care system to offer the vaccine or to refusal by those for whom vaccine is recommended because they fear adverse reactions or believe that the vaccine is either ineffective or unnecessary[22,23,24]. Educational efforts aimed at physicians and the public should address common concerns about vaccine effectiveness and adverse reactions. These include the beliefs of patients at risk that they hardly ever get influenza and the fear of side effects from the vaccine, and doubt about the efficacy of the vaccine.

The advice of a health care provider is often a very important factor affecting whether a person is immunized or not. Most people at high risk are already under medical care and should be vaccinated during regular fall visits. Strategies to improve coverage include the following:

- standing-order policies in institutions allowing nurses to administer vaccine
- vaccinating people at high risk who are being discharged from hospital or visiting the emergency room in the autumn
- promoting influenza vaccination in clinics which see high-risk groups (e.g., cancer clinics, cardiac clinics, and pulmonary clinics)
- using community newspapers, flu-information lines, and collaborating with pharmacists and specialist physicians to distribute positively-framed information about the benefits and risks of immunization
- issuing computer-generated reminders to physicians, mailing reminder letters to patients, or using other recall methods to identify outpatients at high risk
- patient-carried reminder cards
- increased accessibility of immunization clinics to staff in institutions and community-based elderly
- organized activities, such as vaccination fairs and competitions between institutions
- working with multicultural groups to plan and implement effective programs.

RECOMMENDATIONS FOR THE USE OF AMANTADINE

Amantadine hydrochloride is an antiviral agent that interferes with the replication cycle of type A (but not type B) influenza viruses. The following are recommendations for its use in prophylaxis and treatment.

Prophylaxis

The only drug currently approved in Canada for the specific prophylaxis of influenza virus infections is amantadine hydrochloride. It is 70% to 90% effective in preventing illness caused by type A influenza viruses but is ineffective against type B strains. Because antiviral agents taken prophylactically may prevent illness but not subclinical infection, some persons who take these drugs may still develop immune responses that will protect them when they are exposed to antigenically-related viruses in later years. However, *amantadine prophylaxis should not replace annual influenza vaccination in groups for whom vaccine is recommended.*

Amantadine prophylaxis may be used as follows:

- *For the control of influenza A outbreaks among high-risk residents of institutions.* Amantadine should be given to all residents, whether previously vaccinated or not, and to unvaccinated staff (see "Precautions" section below). Consultation with the local medical officer of health to confirm that the circulating influenza strain is type A is essential.
- *As the sole agent for prophylaxis in people at high risk during an outbreak when vaccine is unavailable, contraindicated, or unlikely to be effective due to a shift in the antigenic composition of the outbreak strain.* In this case, prophylactic amantadine must be taken each day for the duration of influenza A activity in the community.
- *As an adjunct to late vaccination of people at high risk.* Amantadine should be continued for 2 weeks after appropriate vaccination is completed. (That is, for those receiving two doses of vaccine, amantadine should be continued for 2 weeks after the second dose).
- *As a supplement to vaccination in people at high risk expected to have an impaired immune response to vaccine.* (This includes persons with HIV infection, especially those with advanced HIV disease. No data are available on possible interactions with other drugs used in the management of patients with HIV infection. Such patients should be monitored closely if amantadine is administered).
- For unvaccinated people who provide home care for people at high risk during an outbreak. Amantadine prophylaxis should be continued until 2 weeks after the care provider has been vaccinated.

Treatment

Amantadine has been shown to reduce the severity and shorten the duration of influenza A in healthy adults. Although there have been no well-controlled studies to demonstrate its efficacy in preventing complications in people at high risk, amantadine may be considered for those at high risk who have suspected influenza A because of the potential benefits. The drug should be administered within 24 to 48 hours after the onset of illness and continued until 2 days after its resolution. Amantadine-resistant influenza viruses may emerge during treatment but there is no evidence that these viruses are more virulent or transmissible than amantadinesensitive influenza viruses. However, the consequences of widespread therapeutic use of amantadine are not known. Studies to assess this issue are required.

Dosage

Recommendations for dosage are presented in Table 2, but the package insert should be read for complete information. Any adjustments for renal function should be made *in addition* to adjustments for age.

Precautions

In otherwise healthy young adults given amantadine prophylactically, 5% to 10% report difficulty concentrating, insomnia, light-headedness, and irritability. These side effects are usually mild and cease shortly after the prophylaxis is stopped; however, they can be more frequent in the older population unless a reduced dosage is used.

Serious side effects (e.g., marked behavioural changes, delirium, hallucinations, agitation, and seizures) have been associated with high plasma drug concentrations. These have been observed most often among persons who have renal insufficiency, seizure disorders, or certain psychiatric disorders, and among elderly persons who have been taking amantadine as prophylaxis at a dose of 200 mg/day. Lowering the dosage among these persons is effective in combatting the severity of such side effects.

Amantadine is not metabolized but is excreted in the urine. Therefore, in people with reduced renal function, particularly the elderly, toxic levels can occur if the dosage is not reduced. **Recommended dosage by age and renal function is shown in Table 2.** The dosage should be reduced in people with a seizure disorder to avoid the risk of increased frequency of seizures. The patient's age, weight, and renal function and the presence of other underlying conditions should be considered and the dosage adjusted accordingly. In addition, patients should be carefully monitored for side effects.

The safety of amantadine use in pregnancy has not been established; therefore, the drug is not recommended for use in women who are or could be pregnant. Since the drug is secreted in breast milk it should not be administered to lactating mothers.

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Table 2
Recommended amantadine hydrochloride dosage by age and renal status

No recognized renal disease		
Age	**Dosage**	
1-9 years[a]	5mg/kg once daily, or divided, twice daily, total daily dose not to exceed 150 mg	
10-64 years	200 mg once daily, or divided twice daily[b]; 200 mg	
≥ 65 years	100 mg once daily[c]	
Recognized renal disease/Insuffisance rénale connue		
Creatinine clearance (mL/min/1.73m²)	**Dosage for those 10-64 years**	**Dosage for those ≥ 65 years**
≥ 80 mL/min	100 mg twice daily	100 mg once daily
60-79 mL/min	Alternating daily doses of 200 mg and 100 mg	Alternating daily doses of 100 mg and 50 mg
40-59 mL/min	100 mg once daily	100 mg every 2 days
30-39 mL/min	200 mg twice weekly	100 mg twice weekly
20-29 mL/min	100 mg three times/week	50 mg three times/week
10-19 mL/min	Alternating weekly doses of 200 mg and 100 mg	Alternating weekly doses of 100 mg and 50 mg

[a] Use in children < 1 year of age has not been evaluated adequately.
[b] Reduction of dosage to 100 mg/day is recommended for people with a seizure disorder, because they may be at risk for more frequent seizures when the dosage is 200 mg/day.
[c] The reduced dosage is recommended to minimize the risk of toxic effects, because renal function generally declines with age and because side effects have been reported more frequently in the elderly.

Calculation of estimated creatinine clearance:

Male: $$\text{CrCl mL/min} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{\text{serum creatinine } (\mu\text{mol}) \times 0.81}$$

Female: CrCl mL/min = 0.85 × CrCl (male)

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International Notes

HANTAVIRUS PULMONARY SYNDROME – UNITED STATES, 1995 AND 1996

Sporadic cases of hantavirus pulmonary syndrome (HPS), a severe cardiopulmonary illness first identified in 1993, continue to be recognized in the United States[1,2]. This report describes the investigation of two cases of Sin Nombre virus (SNV)-associated HPS involving feedlot workers in a single household during May and June 1995, and summarizes national reporting for HPS through 21 March, 1996. The findings of this investigation and of other investigations suggest that, although domestic and occupational exposures to rodents have rarely resulted in infection, sporadic clusters of HPS probably will continue to occur even though individual cases will predominate.

Patient 1

On 29 May, a 27-year-old South Dakota resident sought care at an emergency department because of a 2-day history of fever, chills, headache, myalgia, nausea, vomiting, and nonproductive cough. His temperature was 103° F (39° C) and pulse rate, 118/min. A complete blood count (CBC) included decreased platelets (117,000/mm^3 [normal: 130,000 – 400,000/mm^3]) and a white blood cell count (WBC) of 6560/mm^3 (normal: 4500 – 11,000/mm^3); chest radiographs were normal. An acute febrile illness was diagnosed, and he was discharged to outpatient follow-up. On 1 June, he was admitted to the hospital because of persistent fever (101° F to 104° F [38° C to 40° C]), tachycardia (pulse rate 140/min), and hypotension (blood pressure 70/50 mm Hg). In addition to thrombocytopenia (platelet count 35,000/mm^3) and a mildly elevated WBC (11,470/mm^3 [18% segmented neutrophils, 54% banded neutrophils, 19% lymphocytes, 2% immature granulocytes]), other abnormal laboratory findings included mild azotemia (blood urea nitrogen 38 mg/dL [normal: 9 to 21 mg/dL] and creatinine 2.0 mg/dL [normal: 0.8 to 1.5 mg/dL]), hypoalbuminemia (3.3 g/dL [normal: 3.5 to 5.0 g/dL]), and elevated serum enzyme levels (lactic dehydrogenase [LDH] 2473 U/L [normal: 297 to 628 U/L]; aspartate aminotransferase [AST] 226 U/L [normal: 14 to 50 U/L]; and alanine aminotransferase [ALT] 138 U/L [normal: 7 to 56 U/L]). Although he reported no abdominal pain and the abdominal examination on admission was normal, serum amylase and lipase levels were elevated (amylase 226 U/L [normal: 30 to 110 U/L] and lipase 771 U/L [normal: 23 to 300 U/L]). Chest radiographs at the time of admission demonstrated perihilar interstitial infiltrates. During 1 to 4 June, he became progressively hypoxemic and developed pulmonary alveolar edema and oliguria. His status improved with supportive therapy, and he was discharged 6 June with a diagnosis of possible pancreatitis and/or hepatitis.

Patient 2

On 27 June, the 24-year-old coworker and roommate of patient 1 sought care at an emergency clinic because of a 1-day history of fever, chills, headache, myalgia, sweating, and nonproductive

cough. Physical examination, chest radiographs, serum chemistries, and CBC were normal. On 28 June, because of worsening symptoms, he was admitted to a local hospital for observation and symptom-based therapy. On 30 June, he was transferred to a regional hospital because of tachypnea (respiration rate 34 to 38/min), progressive thrombocytopenia (platelet count from 142,000/mm^3 to 24,000/mm^3), and a left shift in WBC (from 6% to 24% banded forms). He also had developed transient oliguria (no azotemia) during treatment with supplemental fluid therapy. Other laboratory abnormalities included hypoalbuminemia (2.0 g/dL), elevated serum enzymes (LDH 1541 U/L; AST 79 U/L; and creatine phosphokinase 719 U/L [normal: 55 to 170 U/L]), and hypoxia (80% O_2 saturation with no supplemental O_2). Initial chest radiographs demonstrated segmental alveolar consolidation; subsequent radiographs indicated generalized pulmonary edema. During 1 to 4 July, he responded to continued supportive care and was discharged on 5 July with a diagnosis of suspected HPS.

Follow-Up Investigation

Acute- and convalescent-phase serum specimens from patient 2 were submitted to the South Dakota Public Health Laboratory and CDC for hantavirus diagnostic testing. Analysis using an enzyme-linked immunoglobulin capture immunosorbent assay detected immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies to SNV that indicated acute infection. After the diagnosis of SNV was confirmed in patient 2, serum specimens were obtained from patient 1 for testing and were positive for SNV IgM and IgG antibodies. Both ill persons resided in the same house, which was on the premises of a small cattle feedlot at which they were employed. There were no other members of the household, and the only other person who worked at the feedlot had no history of past or recent illness.

Investigation at the feedlot identified multiple potential exposures to rodents or rodent-infested environments (typical in such settings), including straw and hay piles stored in fields, abandoned farm buildings, open-access feed storage sites, and buildings with excess accumulations of dirt, debris, and spilled feed. The feedlot did not maintain a coordinated rodent-control program. In addition, the investigation identified opportunities for contact with potentially infected rodents or their excreta, including handling of dead rodents; feeding of the rodent carcasses to cats and dogs; and cleaning of food storage areas, animal-handling facilities, outbuildings, and living quarters in which evidence of rodent harborage was present. To characterize the local reservoir for SNV, rodent trapping surveys are planned for spring 1996.

MMWR Editorial Note: HPS was first recognized in 1993 following the investigation of an outbreak of fatal acute respiratory illness in the southwestern United States[3]. Since its initial identification, 131 cases have been confirmed in the United States through 21 March, 1996. HPS cases have been recognized in 24 states; the largest numbers have occurred in New Mexico (28 cases), Arizona (21 cases), and California (13 cases). Cases of HPS also have been confirmed in Argentina, Brazil, and Canada. The mean age of the 131 U.S. patients with HPS was 35 years (range: 11 to 69 years), and the overall case-fatality rate was 49.6%.

Cases of potential occupationally related SNV infection have been recognized but are infrequent[4,5]. Among the 131 documented HPS cases in the United States, the exposures related to these cases occurred among grain farmers; an extension livestock specialist; field biologists; and agricultural, mill, construction, utility, and feedlot workers. In addition, in a 1994 study, antibody to SNV was detected in six of 528 mammalogists and rodent workers with varying degrees of rodent exposure in the United States[5]. In contrast, no serologic evidence of infection was detected during a seroprevalence study of selected occupational groups (e.g., farm workers, laborers, professionals, repairers, service industry workers, and technicians) for which the primary jobs did not require rodent contact but whose work activities included potential contact with rodents and rodent excreta in the southwestern United States[4].

Recommendations to reduce the risk for exposure to hantavirus include precautions for persons involved in activities associated with exposure to rodents, rodent excreta, and contaminated dust[6]. Through the HPS registry, CDC in collaboration with other state health departments is reviewing the utility and impact of these risk-reduction measures during such activities and in related vocations.

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